

Remarks

Claim 1 is amended herein, to remove a redundant phrase. The amendment is made as a matter of formality only, and does not affect the scope of the claim or of any limitation therein. No new matter is introduced by the amendment, and entry thereof is requested.

Claims 1 - 18 are in the application. Reconsideration of the application, as amended, is requested.

The points raised in the Office action will now be addressed.

Rejections under 35 U.S.C. § 102(b)

Claims 1 and 10 were rejected under 35 U.S.C. § 102(e) as being anticipated by Huang *et al.* U.S. 6,400,014 ("Huang").

These rejections are traversed. Applicants' invention is directed to methods for manufacturing a plastic ball grid array package having a heat spreader. Claims 1 - 9 are directed to making the package by placing a heat spreader into a mold cavity, placing over the mold cavity a ball grid array including a die mounted on and connected to a substrate, injecting molding material into the cavity, and permitting the molding material to harden to form the mold cap.

Claims 10 - 18 are directed to making the package by placing a heat spreader onto the die support surface of a substrate such that at least one supporting arm of the heat spreader is affixed to the substrate using a resilient fixative, placing a mold cavity over the heat spreader, injecting molding material into the cavity, and permitting the molding material to harden to form the mold cap.

Huang describes heat sinks (Figs. 3 - 7) and completed semiconductor packages having a heat sink (Figs. 1, 8, 9). Huang is silent as to method or process, except as to resin flow.

Particularly, as to Applicants' claim 1, Huang says nothing about placing the heat sink into a mold cavity and then (in a subsequent step) placing the ball grid array over the cavity, as recited in the claim.

And particularly, as to Applicants' claim 10, contrary to the Examiner's assertion (Office action, paragraph 2) Huang says nothing as to at least one supporting arm of the heat spreader being affixed to the substrate using a resilient fixative, as recited in the claim.

Accordingly, Huang does not teach all the elements of Applicants' claims, and the rejections of claims 1 and 10 as being anticipated by Huang should be withdrawn.

Rejections under 35 U.S.C. § 103(a)

Claims 2 – 9 and 11 – 18 were rejected under 35 U.S.C. § 103(a) for obviousness over Huang in view of Brestel U.S. 5,328,811 (“Brestel”). Huang was applied as in the rejections under 25 U.S.C. § 102(e), and as showing a heat spreader made of metal (claims 2 and 11). Brestel is relied upon as teaching treating the undersurface of a copper layer to form a black copper oxide layer (claims 2, 3, 6, 11, 12 and 15); for teaching a range of black copper oxide layer thickness (claims 4, 5, 8, 9, 13, 14, 17 and 18); and for teaching micro-etching the copper undersurface of a copper layer (claims 7 and 16).

These rejections are traversed.

Brestel is in an unrelated art. Brestel is directed to forming an electrically conductive pattern in a copper foil on a dielectric substrate, as for example in manufacture of printed circuit boards. The copper oxide film is eventually removed in the Brestel process, and the copper foil is eventually etched completely through to form the pattern. In contrast, the black copper oxide layer is formed on the underside of the heat spreader according to Applicants’ invention as a structural feature of the completed package; it is there to enhance the adhesion between the surface of the heat spreader and the underlying molding. And, in contrast, according to Applicants’ invention, micro etching is carried out only to an extent sufficient to chemically roughen the surface of the copper heat spreader, again to enhance the adhesion between the heat spreader surface and the underlying molding. (Applicants’ page 7, paragraph [0030].) The copper oxide film and the etching through of the copper foil in Brestel, have nothing to do with adhesion of the copper with anything else in a finished product, and much less do they have anything to do with providing improved adhesion between a heat spreader and an underlying molding in a semiconductor package.

Both because Brestel is in an unrelated art, and because the oxide layer as described in Brestel is a sacrificial layer, not employed in the finished product, and has nothing to do with adhesion, the person of ordinary skill in manufacture of semiconductor packaging would not look to Brestel to combine with Huang to make Applicants’ claimed combinations.

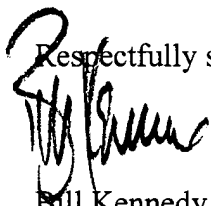
Moreover, Brestel fails to teach the claimed process elements that Huang lacks, as discussed above. Accordingly, no combination of Brestel and Huang makes Applicants’ claimed invention, and the rejections for obviousness over combinations of Huang and Brestel should be withdrawn.

In view of the foregoing, all the claims now in the application are believed to be in condition for allowance, and action to that effect is respectfully requested

This Response is being filed within the third month following the three months' shortened statutory period set by the Examiner for response to the Office action and, accordingly, it is accompanied by a Petition for three months' extension of time and a fee or fee authorization therefor. In the event the Examiner may determine that additional fee[s] may be required in connection with the filing of this paper, petition is hereby made therefor, and the Commissioner is authorized to charge any additional fee (or to credit any overpayment) to Deposit Account No. 50-0869 (CPAC 1014-4).

If the Examiner determines that a conference would facilitate prosecution of this application, the Examiner is invited to telephone Applicants' representative, undersigned, at the telephone number set out below.

Respectfully submitted,

 *Reg. No. 33,407*
Bill Kennedy
Reg. No. 33,407

Haynes Beffel & Wolfeld LLP
P.O. Box 366
Half Moon Bay, CA 94019
Telephone: (650) 712-0340
BK:pfh